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NASA Procedural Requirements

COMPLIANCE IS MANDATORY

NPR 7123.1

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Subject: Systems Engineering Procedural Requirements

Responsible Office: Office of the Chief Engineer

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Prologue

- a. NASA missions are becoming increasingly complex, and the challenge of engineering systems to meet the cost, schedule, and performance requirements within acceptable levels of risk requires revitalizing systems engineering. Functional and physical interfaces are expanding in number and complexity. Software and embedded hardware must be integrated with platforms of varying complexity. Pre-planned project development and the extension of system applications drive higher levels of integration. A driver of increasing system complexity is the significant reduction of operations staff to reduce life-cycle cost and incorporation of their workload into the system. In addition, systems are moving toward increased autonomy with stored knowledge, data gathering, intra- and inter-system communications, and decision-making capabilities.
- b. The engineering of NASA systems requires the application of a systematic, disciplined engineering approach that is quantifiable, recursive, iterative, and repeatable for the development, operation, maintenance, and disposal of systems integrated into a whole throughout the life cycle of a project or program. The emphasis of systems engineering is on safely achieving stakeholder functional, physical, and operational performance requirements in the intended use environmentsáover the system's planned life within cost and schedule constraints.
- c. While rising to the greater challenge, NASA must also address concerns over past failures. The need for this SE NPR was driven both by past experience and evolving NASA program requirements. Drawing on the result of reports and findings, the Office of the Chief Engineer (OCE) initiated a revitalization of engineering to provide for future missions. This NPR satisfies the component of the revitalization that calls for Agency-level requirements to establish standard technical practices for systems engineering.
- d. The vision for systems engineering is to "develop and implement a framework and promote the environment for excellence and the revolutionary advancement of systems engineering capability and projects."to anticipate and meet the needs of NASA programs [1] A robust approach is required to meet the Agency's objectives. Achieving the goal requires systems level thinking on the part of all project participants to accomplish the engineering of NASA systems.
- e. This transformation is necessary to provide consistency across the Agency and advance the practice in NASA. This SE NPR will then be applicable to not just the discipline of systems engineering, but the technical teams that perform the activities to engineer the missions for the Agency.
- f. This document establishes the common technical processes for implementing NASA products and systems, as directed by NPD 7120.4, Program/Project Management. Additionally, this NPR establishes the common NASA systems engineering technical model and presents tailoring and waiver guidelines. This document complements the administration, management, and review of all programs and projects, as specified in NPR 7120.5, NASA Program and Project Management Processes and Requirements.

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